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ALBERTA WEATHER WEBSITE DRIVES NEXT GENERATION AGRICULTURE

**Better information, better planning, better results for
farmers, researchers and industry.**

Alberta farmers now have the power of more than 270 near real-time weather stations across the province at their fingertips.

A new website has been launched for the AgroClimatic Information Service (ACIS), located at www.agric.gov.ab.ca/acis. This user-friendly weather and climate information tool is designed to support farm management and a variety of broader uses.

ACIS gathers hourly data from a network of weather stations more than 270 strong, which includes 117 owned and operated by Alberta Agriculture and Rural Development (ARD). The remainder are owned or operated primarily by Alberta Environment, Alberta Sustainable Resource Development, Environment Canada and Agriculture and Agri-Food Canada.

Collectively, these stations automatically feed in over 40,000 hourly observations per day to ACIS, which are quality controlled and become part of the sophisticated, yet easy-to-use online service that offers a wide range of uses of interest to producers, farm consultants, researchers, government, industry and others.

"This is a very comprehensive and sophisticated service," says Ralph Wright of ARD's Agro-meteorological Applications and Modelling Unit, a member of the team that designed and implemented the service. "It has a wide variety of information and there is a lot you can do with it, including many very practical applications to support farmers in their planning and decision making. It represents a new generation of improvement in the potential to use weather and climate information to support sustainable, profitable farming."

Strong AgMet network powers results

ARD's network of meteorological stations is generally referred to as an "AgMet network," which combines the words "agriculture" and "meteorological."

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**Government
of Alberta ■**

Alberta ■

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The network was started in 2002, at a time when ARD operated no weather stations. While some public networks and private efforts existed in various forms, none were easily accessible, coordinated or focused enough to offer much value for agricultural purposes, and there was simply a major shortfall in the number located in agricultural areas.

A driving force in establishing Alberta's AgMet network was the need to have better information to improve risk assessment for drought monitoring and reporting, irrigation water use efficiency and crop insurance purposes, recalls Wright. Initially, the Alberta Drought Risk Management Plan and the need for improved irrigation scheduling led the charge for new stations. Later, Agriculture Financial Services Corporation (AFSC) led the call for further expansion in the agricultural areas and network expansion took shape, backed by both provincial and federal funding.

Since 2002, three major phases of station development gave rise to the current AgMet network. First, 36 stations were put in to enhance the Drought Risk Management Plan. At about the same time, 11 Irrigation Climate Monitoring stations were added. Between 2006 and 2008, 69 more stations were added to improve crop insurance programs. Plans are in development in partnership with AFSC to add 50 more stations.

"The number of stations involved and their location was very important," says Wright. "The idea was to capture local variations in climate where large gaps existed in rural areas, and that meant a lot of ground to cover. The objective was to have no producer further than 20 kms from a station."

In the process of establishing the AgMet network, the vision for it was expanded with an aim to capture the broadest use potential possible under the investment, including many uses for agricultural purposes and for a wide variety of broader applications. This meant quality controlling the data and making it widely and freely available through the Internet.

Partnerships strengthen data

Partnerships with existing public weather station network operators were established to strengthen the system and avoid duplication, and the development of ACIS soon followed as a means to centrally collect, organize and disseminate the information into usable forms.

"As a public effort, it was critical to provide easy and free access to the data," says Wright. "We also wanted to go well beyond simply making the information easy to access, by also making it easy to customize, organize and analyze for a variety of uses. That's what ACIS is all about."

ACIS currently houses over 5000 maps dating back to 1961, with more than 30 added each week, which describe current conditions as they develop.

ACIS maps depict a variety of climate and weather variables including precipitation 'normals' and historical patterns. "The maps can illustrate the answers to a number of both important and interesting questions, from 'What is the average precipitation for a particular area, to 'How much precipitation falls during a dry spell that may occur once in 20 years.'"



"ACIS is arguably the best place for producers to get accurate weather information relevant to their operation."

The possibilities include finding out how much precipitation may have occurred in a specific past year – say, for example, during the growing season in 2002 – and how that compared relative to 'normal.' This can lead to other questions, such as 'What fell relative to normal? Was it 50 percent of normal?' or 'How often does this occur – once in 25 years or once in 12 years?' Other map series include snow packs, soil moisture, as well as temperature regimes and trends. "In addition, users can graph and download data from the stations and determine such things as precipitation accumulations, maximum and minimum temperature extremes and even track growing degree days," says Wright.

These are just a few examples among several other useful options available for viewing and download. In fact, hourly data from approximately 75 percent of the weather stations available on ACIS is only two hours old or less.

More advanced users or organizations can also subscribe to an RSS feed and build sophisticated applications that require weather data feeds.

Near real-time, quality controlled

Two further broader steps were to add near real-time capacity and quality control. As a result, the new hourly information received by the service is automatically updated and the meticulously designed quality control system works unfailingly to immediately identify and fix data gaps or potential errors.

"We're one of the largest near real-time, year-round weather network operators in the province, and no one is quality controlling the data in near real-time to the extent that we are," says Wright.

Knowledgeable operators such as Wright and fellow ACIS designers Mei Yin, Daniel Itenfsu and Jianzhao Huang, oversee and troubleshoot any issues not handled by the automated system, to keep things running smoothly and constantly look for new ways to enhance and upgrade the system.

New and improved website

Though ACIS has been available online since 2005, the new upgraded version just launched features a number of these enhancements in everything from usability and presentation to depth and sophistication of the information and applications.

For one example, the new system is now Google map based, enhancing usability and offering a format more regular web map users are becoming familiar with.

The new system even includes an option for users to receive customized RSS feeds (automatic digital information updates) from the service, to get the data immediately on their computer as it comes in, and to make sure they always have the most recent copy of the ACIS data. "If a station or new sensor is added to the network, the RSS feed will tell you that as soon as the data becomes available," says Wright.

"We believe we have one of the best systems of its kind for delivering this type of information in Canada right now. We encourage farmers and others to try it out and see how they can take advantage of this resource."

Key data tracked

The weather stations capture a solid record of weather and climate information on an hourly basis, delivered to and updated on the ACIS system in near real time. Information captured includes hourly and daily observations of:

- Precipitation (269 stations)
- Temperature (271 stations)
- Humidity (179 stations)
- Solar radiation (73 stations)
- Two metre wind speed (130 stations)
- Two metre wind direction (67 stations)
- Ten metre wind speed and direction (108 stations)
- Soil moisture and temperature (38 stations)
- Snow depth (25 stations)

Lots of ways to use

Farmers can use ACIS for anything from checking the local weather forecast and current conditions, to analyzing longer term trends and patterns in soil moisture, temperature and precipitation, etc. This will help them to select stations for insurance purposes, understand local climatic variations, track agronomically important

trends, and to help plan their future cropping decisions or farm operations.

"There's lots of practical stuff and lots of neat stuff you can do with it," says Wright, who is used to playing tour guide to the various options. "Most of what comes to mind for first time users just scratches the surface. It's a case of, the more you use it, the more you see what you can do. There are many possibilities to support your management decisions or other components you're interested in."

A few examples among many

Local climate weather updates. "Because there is a weather station relatively close to every operation, ACIS is arguably the best place for producers to get year-round weather information relevant to their operation," says Wright.

Local climate and weather analysis. This more accurate information allows for a broad range of improved analysis, and ACIS is designed to help producers accomplish this in a straightforward, user-friendly way.

Crop insurance risk assessment. Better information to make crop insurance risk assessment more accurate and transparent.

Cropping strategies. ACIS feeds into the trend of more precise farming by providing more specific and sophisticated information to guide field-related farm management decisions, including cropping strategies as a leading example.

"This may also involve risk analysis for growing higher value crops that require a little higher temperature or little longer growing season or more precipitation," says Wright.

Precipitation trends. History remains one of the best teachers and there is no better way to keep on top of precipitation trends specific to an operation or a region than a system such as ACIS. "Users can browse a wide variety of maps dating back to 1961 and look at climate 'normals', trends and extremes, both provincially and locally," says Wright.

Irrigation scheduling. All the variables needed to run accurate soil water balance models are now being collected allowing producers to run web accessible and customizable models that estimate water use for their operations. This translates to water savings and increased crop yields.

Water use efficiency strategies. At both the level of an individual operation or larger regions, the ACIS weather and climate data also supports the development of more dependable water use efficiency strategies.

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ACIS by the numbers

- 117 ARD weather stations
- 271 total weather stations
- 40,000+ daily observations
- 71 stations with solar radiation capacity
- 38 stations with soil moisture and temperature
- 0 dollars for individual farmers and others to use this free public service

"This tool can provide valuable analysis to support and evaluate alternative energy options."

Insect and disease modeling. ACIS data feeds may also be used toward the development of insect and disease models that can give producers a 'heads up' when it comes to insect or disease conditions that may be developing in their area.

Flood and drought forecasting. Among the many results is improved weather, flood and drought forecasting.

Emergency measures. Better risk analysis and response to a range of potential emergency situations is another clear benefit. For one example, in the event of a toxic release, ACIS wind information can feed into risk analysis schemes. The system is sophisticated enough to even allow the tracking of specific wind plumes.

Alternative energy assessment. This is an area of tremendous future potential for ACIS to play a strong role. "The solar radiation data is key to assessing solar power options, and the wind data likewise is key to looking at the wind power options," says Wright. "These are just two examples among many."

Feeding into global circulation models. ACIS has an important role in supporting local, regional, national, continental and global weather and climate models, including global circulation models. "Also, since all of the AgMet stations are registered with the

Meteorological Service of Canada, climate data archive. This provides and for generations to come," notes

Climate change analysis. One high profile example of how the Alberta AgMet Network and ACIS information can support broader, "big picture" analysis of key issues, is the opportunity for climate change analysis.

"No matter where you stand on the global warming debate or the drivers of climate change, having better raw data to support analysis is clearly a benefit," says Wright.

Upgrade-ready, partner potential

Throughout the evolution of ACIS, weather stations and service components have been designed where possible to allow for efficient improvements and additions over time.

For example, all weather stations are built 'scalable' and are ready for additional sensors

"That's huge," says Wright. "The big expenses with stations are A: getting the land, B: putting in the infrastructure on the land, C: getting the satellite connection going, and D: developing the quality control software and web-based data delivery systems. But now with all that in place, the additional cost of adding sensors and providing additional data is pretty minimal.

"So there's good opportunity for us to enhance what we're doing, and also a fantastic opportunity for partnerships." ♦

USING TECHNOLOGY TO STRENGTHEN FARM MANAGEMENT

ACIS is one example of the opportunities for innovation.

The ARD investment in Alberta's AgMet network and the AgroClimatic Information Service (ACIS) is part of supporting farm management on many levels.

The most direct application is supporting on-farm management through more specific, more sophisticated and easier-to-use technology. It's also a major investment in infrastructure to support innovation in alternative energy. And at its broadest level, this investment ratchets up the sophistication in capacity to support planning and decisions on broader issues and debates such as climate change.

"Investing in over 100 weather stations in just a few years is a pretty good sign that you're serious about progress in these areas," says Ralph Wright of ARD's Agro-meteorological Applications and Modelling Unit. "The Alberta AgMet network and ACIS are tools that can benefit farmers and industry now and far into the future." ♦

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Hop in the drivers' seat
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